

TENNESSEE VALLEY AUTHORITY

# KINGSTON FOSSIL PLANT

ANNUAL ASH POND DIKE  
STABILITY INSPECTION  
2008



Prepared by: Jamey Dotson  
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**General**

The waste disposal areas at Kingston Fossil Plant were inspected for dike structural stability on December 4, 2007. The inspection was performed by Jamey Dotson (EDS) and Brian Lankford (CCBP), with Linda Campbell (KIF) being present for a portion of the inspection. The previous annual inspection was performed on November 21, 2006. The results of the annual inspection are listed below according to location.

**Active Ash Disposal Area**

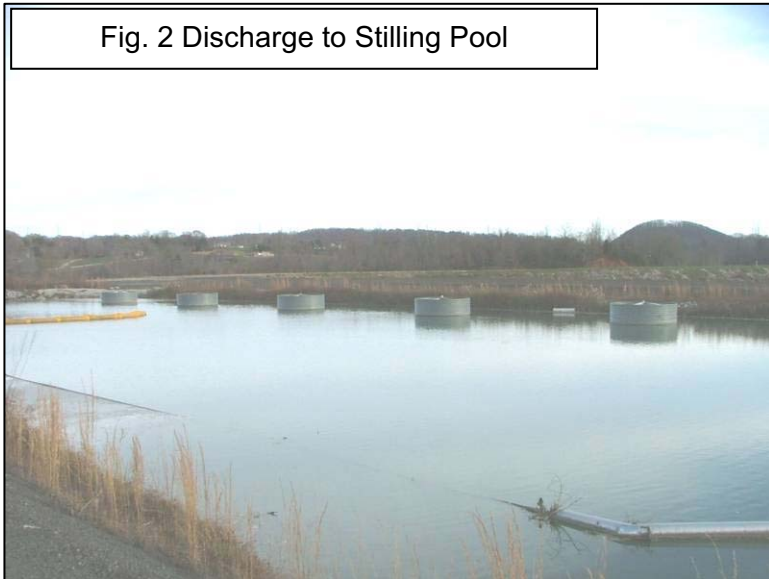
Bottom ash is sluiced into a channel southwest of the active ash disposal area. The bottom settles out in the channel and is removed by dragline, which is subsequently used for dike construction.

Fly ash is sluiced into an adjacent channel to the bottom ash channel where it flows into the main ash pond. The fly ash channel was cleared of vegetation last year. Both channels flow northeast into the active ash pond. See Figure 1 and drawing API 2008.



Fig. 1 Sluice Channels to Ash Pond

Fig. 2 Discharge to Stilling Pool



Sluice water flows from the active ash pond into the stilling pond through the five spillways constructed in 2005 (see Figure 2), as part of a project to allow more accurate accounting of free water volume. The old plant constructed spillway (Kennedy Weir) was taken out of operation at the same time. From the stilling pool, the water discharges into the plant intake channel via six standard spillways equipped with discharge diffusers constructed in November 2003. Many of these structures have vegetation and brush growing inside them, which needs to be removed.

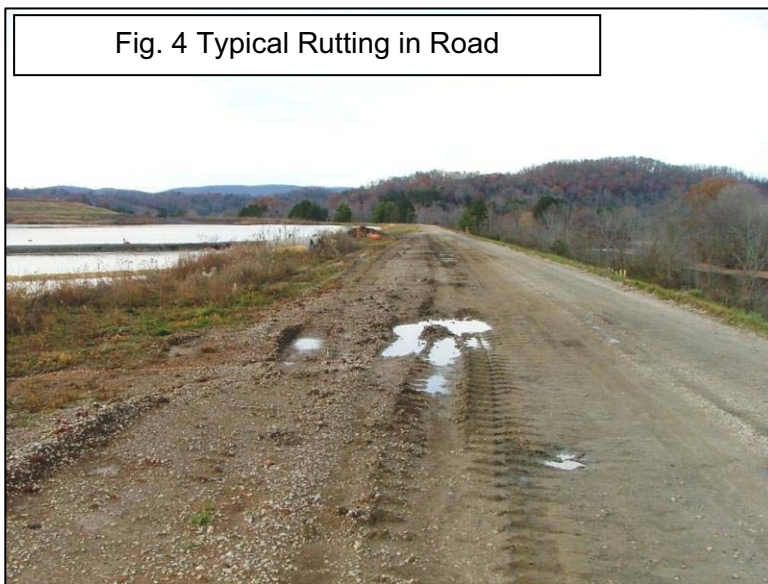
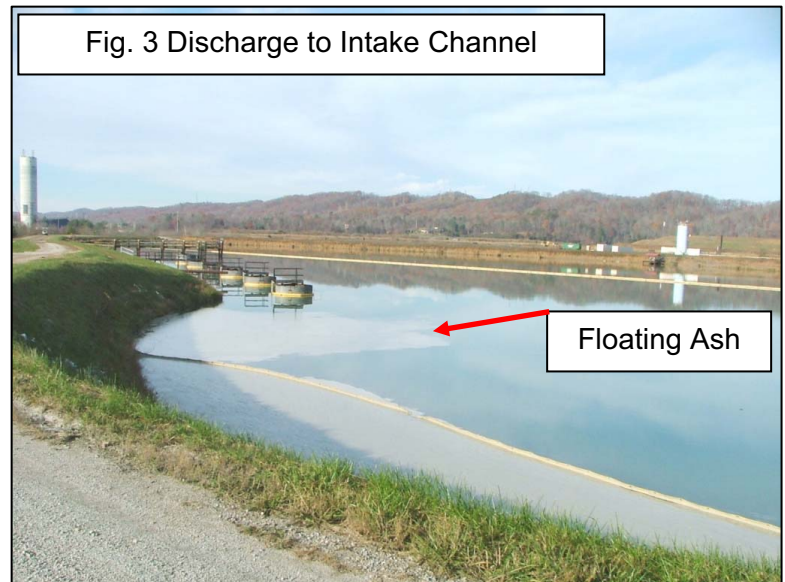
All exterior dike slopes around this area appeared to be in sound condition with

excellent vegetative cover. The interior of Dike "C" is showing some signs of erosion at the water line. These areas should be stabilized with riprap to prevent wave action erosion. The dikes had been mowed recently and were in very good condition. The grass on the dike between the stilling pool and the intake channel was only cut halfway down the slope leaving a vegetative buffer zone. Previously, grass clippings from mowing this slope had entered the discharge spillways partially clogging them. This caused the stilling pond level to raise a couple of inches. Plant personnel inquired about spraying this

**KINGSTON FOSSIL PLANT  
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2008**

slope to inhibit vegetation growth as an alternative to mowing. There were some areas of erosion and gullies, but the area appeared stable otherwise.

Large amounts of floating ash have been contained within floating skimmer booms (two inside both the active ash pond and the stilling pool). This ash should be removed in order to prevent an accidental release. Some of this ash has breached the booms and is near the discharge structures. See Figure 3. The seeps along the toe of Dike C and below the toe of the dike along the intake channel, known since the early 1980s were not visible during this inspection.



Some of the dike roads exhibit areas of rutting, see Figure 4. This photo is typical of the conditions of the roads, although it does not appear to be a significant problem



**KINGSTON FOSSIL PLANT  
ANNUAL ASH POND DIKE STABILITY INSPECTION  
2008**

Construction of an internal divider dike inside the active ash disposal area is currently underway. The divider dikes will be constructed to build a base of fly ash for a dredge cell expansion, which will eventually cover approximately half of the existing main ash pond. See Figure 5.



#### **Dredge Cells**

Prior to November 2003, the fly ash from the active ash disposal area was periodically dredged into raised dredge cells located in the western portion of the disposal area. In November 2003, dredging operations ceased because of a leak in the toe of the dike slope for Cells 2 and 3. Through 2004 and 2005, ash was dredged to a newly constructed interim cell while repairs were made to the original dredge cells. Dredging resumed to the original dredge cell location in early 2006.

The interim dredge cell capacity has been depleted; however decant water from the raised dredge cells flows through the

interim cell to the main ash pond. Water flow into the interim cell is essential for dust control. The divider dike between this cell and the active pond appeared to be in stable condition with some bench rutting and poor vegetation. There was one section of standing water approximately 100 feet in length. As much as practical, these areas should be graded so they will drain, even if slowly. Wheel ruts that hold water should be filled with bottom ash and covered with stone if they are in a road. See Figures 6 and 7 (next page).

Construction of repairs for the 2003 slope failure was completed in October 2005. Underdrains were installed in the lower two benches to relieve water pressure. One of these underdrains in particular continues to flow with clear water. The drainage ditch at the toe of the dike along Swan Pond Road was enlarged to accommodate the additional flow. This ditch has a high point approximately 400-feet north of



**KINGSTON FOSSIL PLANT  
ANNUAL ASH POND DIKE STABILITY INSPECTION  
2008**

Fig. 7 Standing Water, Lack of Vegetation



the intersection with the plant access road.

North of the high point, runoff and leachate drain into a sump pond, which is pumped to the ash pond, with an emergency overflow is to Swan Pond Embayment. The pumps are electric powered with high water level alarm indicators at the control panel. South of the high point, runoff and leachate runs south and east to the ash pond.

In November 2006, after the dredge cells had been back in operation for about 9 months, a localized failure occurred very near the 2003 failure. It was determined that the failures were caused by excessive seepage resulting from a combination of issues: inadequate internal drainage (addressed in 2005) and infiltration of

surface water on the existing dike benches. Local anomalies in the subsurface conditions were likely increasing groundwater velocities and causing an upward gradient near the toe of the dike. A system of dewatering wells was installed in 2006, which helped ease the construction of a riprap toe buttress along the areas of this failure. The riprap allows a conduit for the water to leave the dike, lowering the phreatic surface. Approximately 30 shallow piezometers were also installed to monitor the water levels in the dike. Two spring boxes (36" diameter concrete pipes installed vertically over a bedding of gravel surrounded by filter fabric with a perforated drainpipe) were installed in the areas of the most saturation. These wells have a high capacity for allowing water to exit the dike. The dewatering wells were left in place as an extra monitoring point after construction. These repairs have reduced the near-surface groundwater elevations.

Since last year's inspection, ash was dredged into Cells 1, 2, and 3 to such levels that the divider dikes for Cell 3 were buried and now there are only two large cells (1 and 2). Dredging was stopped in mid-November 2007 based on recommendations from EDS and Geosyntec Consultants, Inc. This preventative measure was taken to reduce water levels in the dredge cell through the winter months in an attempt to avoid another blow out. EDS collaborated with Geosyntec to prepare a design to address

Fig. 8 Downdrain & Catch Basin, Bench





**KINGSTON FOSSIL PLANT  
ANNUAL ASH POND DIKE STABILITY INSPECTION  
2008**

the poor bench drainage. The lower benches will be re-graded to provide positive drainage to a series of catch basins which will divert the water collected to the lower drainage ditch. Construction is currently underway to install surface drainage repairs, (See Figure 8, Figure 9 (next page), and Drawings 10WXXX-1 through -10 for details). In addition to these repairs, outlets are being installed on the old dewatering wells to allow personnel to relieve some of the water in these wells. The water drained will flow to the riprap channel along Swan Pond Road.

Fig. 9 Looking NE along Bench #1



On January 2, 2008, the dredge cells had dried out to the point where fugitive dusting was an issue. Dredging operations resumed for one day, to wet the dredge cells until a permanent solution could be reached. A decision was made to spray the interior of dredge cells 1 & 2 with a polymer coating to prevent dusting until dredging operations are resumed.

An area, which was believed to be a seep, was located on northeastern dike of cell 2.

Plant personnel accompanied the inspectors to the area to investigate. Upon digging in the area, it was determined that the running water was originating from an old underdrain system. The water was clear flowing, but there were signs that it

had contained red water in the past. The red water staining was due to irons leaching out of the bottom ash contained in the dredge cell.

Plant operations have done a commendable job of mowing the dredge cell slopes. Small trees growing on the slopes were recently cut level with the ground. If trees are too large to be mowed, the trees should be cut, the stumps removed, and the area backfilled with soil and seeded.

### **Chemical Treatment Ponds**

The chemical treatment ponds (iron and copper) are located southwest of the active ash pond. Both ponds were excavated and have no exterior slopes. The internal dike slopes are covered with riprap. These slopes were in good condition with a few trees present. See Figure 10. Sediment in the ponds was tested in FY 2004 and found to be non-hazardous. It appeared that some maintenance had been recently performed at one of the pond platforms. Old gaskets were on the ground and there was a new pipe flange and hardware. The platform at the smaller pond was missing a pump.



Fig. 10 Trees near Discharge to Pond

**KINGSTON FOSSIL PLANT  
ANNUAL ASH POND DIKE STABILITY INSPECTION  
2008**

Fig. 11 Breached Check Dams



**Coal Yard Drainage Basin**

The coal yard drainage basin is located at the southwest corner of the coal pile. This basin was excavated below grade; therefore, there are no exterior dikes. The interior slopes appeared to be in satisfactory condition. Normal discharge from this basin is pumped into the fly ash discharge ditch and flows to the active ash disposal area. The basin was cleaned out in 2006, but is in need of another clean out. The bottom of the pond should be no higher than elevation 745 at the pump platform. Elevation 745 allows 2-feet of clearance below the pump intakes to prevent pumping solids. In addition, the "V-shaped" pond extensions added during the summer of 2001 to increase the pond

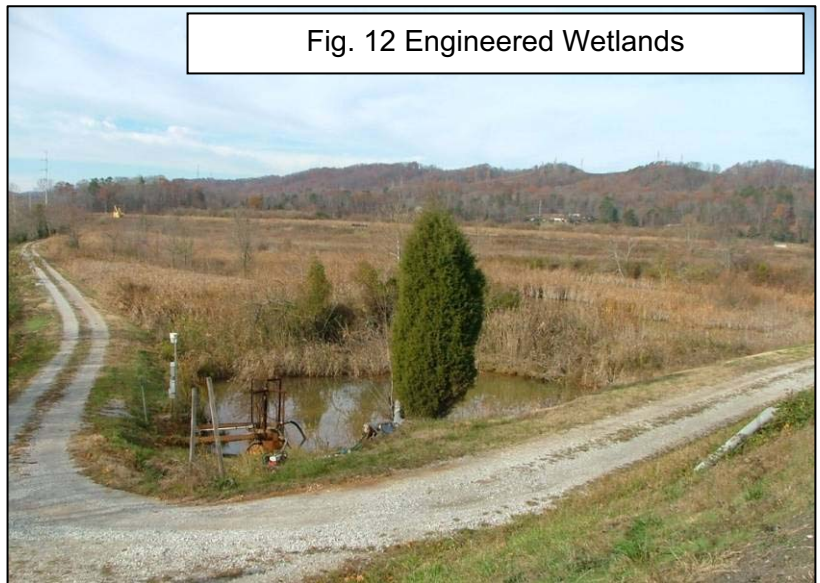
storage volume contained coal yard sediment. The above figure shows rock check dams built to keep the coal fines away from the pumps. The check dams appear to have been breached, allowing suspended solids to reach the pumps. TVA drawing 10W225-2 (attached as API 2008-2) shows the pond and its intended bottom contours.

**Engineered Redwater Wetlands**

The engineered wetlands along the southwest dike receive seepage that collects in the anoxic limestone drain below the bottom ash trench. The wetland appeared to be functioning, but the discharge is still pumped via two pumps to the ash pond, see Figure 12.

The water levels in the pump structures were at different levels at the time of inspection. There were several trees varying in size growing on the interior dikes of the ponds.

Fig. 12 Engineered Wetlands



**KINGSTON FOSSIL PLANT  
ANNUAL ASH POND DIKE STABILITY INSPECTION  
2008**

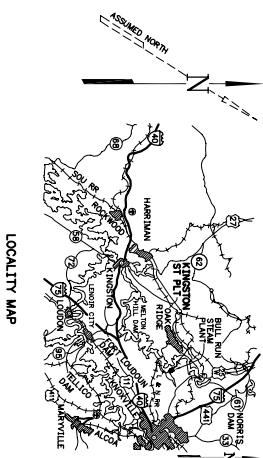
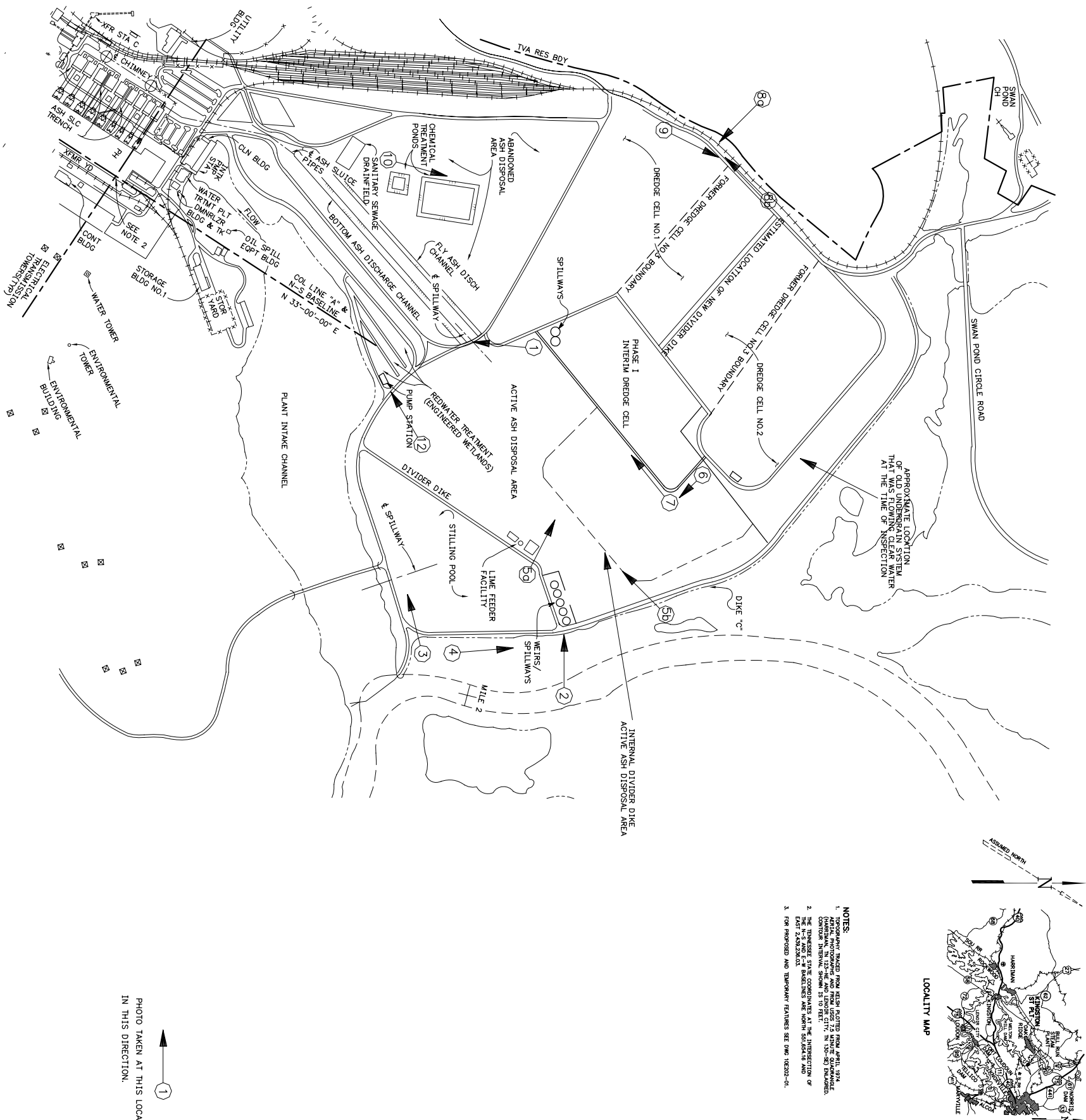
**Actions Since Last Inspection**

- Sparsely vegetated areas on the dike slopes have been reseeded and appear to be in good condition. The upper lifts of the dredge cells need a more attention.
- Trees cut/removed and dikes were mowed.
- Monitoring of the Dredge Cell dikes for seepages has continued.
- Dredging Operations were discontinued in November 2006, based on recommendations from EDS and Geosyntec Consultants, Inc.
- The interior of the Dredge Cells was sprayed with a polymer anti-dusting agent.
- Implementation of surface drainage repairs began in January 2008.

**Recommendations**

- Repair any dikes showing signs of erosion on the pond side. Erosion ditches larger than a standard railroad crosstie should be repaired with compacted bottom ash. Repeated repairs in the same location calls for riprap stabilization. EDS-Civil will assist in sizing the riprap and setting the limits if needed.
- Dredge cell drainage ditches should be kept free of cattails so they will flow as well as possible. Any existing cattails should be removed.
- Install a third spring box on the side of the Dredge Cell paralleling Swan Pond Road. This will allow provide controlled relief of excess pore water pressure and allow an additional release of water from the dikes.
- Remove trees from the slopes of the dikes. Mowing at least twice a year is recommended to control the size of the trees. Preventing the trees from getting larger than 1" in diameter at the ground is preferred. Any trees larger than 3" in diameter at the base must be pulled from the dikes, roots and all. Repair and reseed the damaged area.
- Monitor the limestone drain area and all exterior dike slopes (along Swan Pond Road in particular) for seepages, soft wet spots, animal burrowing, sloughing, etc., and report any changes to Jamey Dotson of FPG Engineering Design Services, 423-751-6421.
- Dredge the Coal Yard Drainage Basin to restore its design contours and protect the pumps from further damage. There is an estimated 2,800+ cubic yards of sediment in the original pond and an extra 3,400+ cubic yards in the "V" section that needs to be removed as soon as reasonable. See the attached copy of 10W225-2. Estimated at \$55,000, depending on haul distance.
- Remove vegetation growing inside spillway structures.
- Investigate the use of spraying to inhibit vegetation growth on the interior dikes of the stilling pond.
- Remove ash floating on the surface of the ash and stilling ponds.
- Repair rutting in the access and dike roadways. Fill with bottom ash and regrade as required to promote drainage.
- Continue intermittent dredging into the interim dredge cell to inhibit fugitive dusting.
- Re-establish riprap check dams in the coal yard drainage basin to prevent solids away from the pumps.





- NOTES:
1. AERIAL PHOTOGRAPHS WERE TAKEN FROM THE SITE FROM APRIL 1978. AERIAL PHOTOGRAPHS AND FROM 1955 TO 1975 WERE OBTAINED FROM THE TENNESSEE STATE GEOLOGICAL SURVEY, 100-80 BROADWAY, KNOXVILLE, TN 37912. THESE PHOTOGRAPHS WERE SHOWN TO THE FIELD ENGINEER AND THE RESULTS WERE SHOWN TO THE FIELD ENGINEER.
  2. THE TENNESSEE STATE GEOLOGICAL SURVEY AT THE INTERSECTION OF THE N-S AND E-W BASELINES ARE NORTH 55.55416 AND 105.55416 DEGREES.
  3. FOR PROPOSED AND TEMPORARY FEATURES SEE DWG. 10000-01.

PHOTO TAKEN AT THIS LOCATION  
IN THIS DIRECTION.



ASH DISPOSAL AREA  
2008 ANNUAL INSPECTION

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TENNESSEE VALLEY AUTHORITY  
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R14 DATE 04/29/91 36 C API 2008  
PLOT FACTOR:4800  
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REVISION	DATE	BY	DESCRIPTION	APPROVED BY	DATE	BY	DESCRIPTION	APPROVED BY	DATE	BY	DESCRIPTION
1	04/29/91	36	C	API 2008							

TASK COMPLETED BY:	REV NO.	SCALE: NONE	EXCEPT AS NOTED

